DOCUMENT RESUME

ED 297 915 RC 016 722

AUTHOR Mu'min, Ridgely A.
TITLE Factors Influencing the Interstate Distribution of Human Capital.
PUB DATE [88]
NOTE 16p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis; *Differences; *Educational Attainment; Educational Economics; Higher Education; High Schools; *Human Capital; *Labor Force; Public Policy; *Regional Characteristics
IDENTIFIERS Alaska; *Defense Contracts; Kentucky

ABSTRACT

The interstate distribution of defense contract awards may both influence and be influenced by regional differences in educational attainment levels. Data from the 1980 census indicate that the level of educational attainment of adult workers was lowest in Kentucky and highest in Alaska. Statistical analysis of the relationships between this educational difference and the dollar values of defense contracts awarded before and after 1980 showed that 1980 educational level was significantly related to past defense contract awards at the .05 level, and future defense contract awards at the .01 level. In a breakdown of the education variable, future contracts were related to percentages of both high school and college graduates, but past contracts were related only to the college variable. In this context, defense contracts can be an indicator of the effects of "high tech" industries in general on a work force. The distribution of defense contracts may affect the educational level of a state's work force by triggering the migration of highly-skilled and educated workers. Policy makers should consider defense contracts as a possible lever to improve their state's stock of human capital. The report contains four statistical tables and seven references. (SV)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED297915

ABSTRACT

Factors Influencing the Interstate Distribution Of Human Capital

by

Ridgely A. Mu'min

Economics of human capital as a subset of Classical and Neoclasical theory has focused on the significance of training as it relates to wage variations. How to measure human capital and the factors that influence its development, along with measuring worker productivity have been continuing topics of research and debate (McCrackin, 1984).

However, what is missing from most of these studies are policy variables other than increased dollars for educational programs and job training that can be used as levers for changing the aggregate level of human capital. This paper offers defence contract awards as a possible additional exogenous variable that may help to explain regional differences in human capital.

Both hypotheses of no association between defence contracts and education are rejected at the .05 level of significance. This indicates that present levels of education may be influenced by the past distribution of defence contract awards while at the same time influencing the future distribution of defence contract awards between the states. Defence contracts may play an important role in the distribution of human capital between the states.

MAR 1988
RECEIVED
ERIC/CRESS

RC016722

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

RIDGELY A. MU'MIN

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

Factors Influencing the Interstate Distribution Of Human Capital

Economics of human capital as a subset of Classical and Neoclasical theory has focused on the significance of training as it relates to wage variations. How to measure human capital and the factors that influence its development, along with measuring worker productivity have been continuing topics of research and debate (McCrackin, 1984).

Differences in human capital distribution between states or regions can be attributed to either differences in production or migration. Some previous studies have focused on the micro level issues of human capital development trying to determine the motivations behind the individuals willingness to invest in human capital. Educational levels have been used by researchers as one measure of human capital (Jeong, 1979: Bhola, 1986). Studies have also found that the level of education and training are positively associatated with higher wages (Becker, 1964).

The level of educational attainment has even been included as an endogenous variable in simultaneous equation models (Jeong, 1979) with income included with the explanatory variables along with age, region of residence, occupation, Veteran status, and race.

According to Shultz (1971) economic growth requires much internal migration as workers adjust to changing job

opportunities. Myers and Bowman (1967) emphasized the possible large human capital gains and losses due to migration even though the methods of calculating human capital may give a too simplistic view of migration.

The human capital investment models can be considered supply models, while migration can be seen as a response to demand for certain types of human capital. Since the production of human capital requires substantial investments of time on the part of the individual, one can expect long lag periods between investment and resulting measures of capital changes. However, changes in demand for human capital can have a much quicker affect on the distribution between regions or communities.

Emphasis on supply or demand as components to human capital differences between regions also influences the choice of possible policy variables suggested for augmenting the level of that capital. A supply emphasis may suggest policies such as increased dollars for educational programs and job training. However, this paper is taking the demand approach and offers a possible additional exogenous variable that may help to explain h
regional differences in human capital.

Defence Department Contracts:

From Table 1 one can see that the majority of defence contracts are for aircrafts (23.36%), electronics and communications (15.76%) and missiles and space systems (13.36%). This distribution would indicate that the defence department purchases goods which require a high level of technological

sophistication for their production. Indeed one can consider the

Table 1: Defence Contract Awards by Program

TYPE	DEFENCE CONTRACT AWARDS (1984) (BIL. DOLLARS)	(PERCENT)
AIRCRAFTS	29.2	23.36
ELECTRONICS AND COMMUNICATIONS EQUIPMENT	19.7	15.76
MISSILES AND SPACE SYSTEMS	16.7	13.36
SHIPS	9.4	7.52
TANK-AUTOMOTIVE	5	4
AMMUNITION	4	3.2
WEAPONS	2.4	1.92
SERVICES	8.5	6.8
ALL OTHER	30.1	24.08
TOTAL	$125.0	

Source: Statistical Abstract of The United States, 1986

industries supplying such goods as "high-tech" requiring a sophisticated and highly skilled work force for their development and production. Therefore, one can assume that if a community or state has received such defence department contracts, that state must have or must obtain the neccessary expertise for the fulfillment of the order. In 1980 the average level of contracts for the 50 states under investigation amounted to $513 per worker over 25 years old. This $513 per worker represents only the awards to the prime contractor, but the additional income to the supporting industries and suppliers could represent even more of an impact. Therefore, defence department contracts can be used as a proxi for determining the effects of "high tech" industries on a work force.

Objective:

To evaluate the relationship between Educational levels accross states with the level of Defence Contracts Per Worker.

Data:

1980 Census data will be used to determine the differences between the fifty states plus D.C. in terms of education. The level of defence department contracts is obtained from The Statistical Abstract of the U.S.

Operationalization of the Variables:

The measures described below are taken from (Mu'min, 1988) and compares a given community - in this case a state - to a typical U.S. community on different attributes of human capital development including education and pay scale differences.

Variable 1 = OCEW or Educational Resource Capacity (comparing different distributions of education controling for age and pay scale).

Variable 2 = OCPW or Pay Scale Comparisons (comparing different Returns or Pay for Human capital resource controling for education and age)

OCEW compares different levels of educational distribution using the national wage rate corresponding to given levels of education controlling for age and pay scale. An OCEW of 0 would

indicate that a particular state has a comparable educational distribution to the national levels. An index of less than 0 would indicate that a state is earning less money due to a less educated work force. The cost of that lack of education would be indicated by the difference between the U.S. income times the state educational distribution and the U.S. income times the nationally adjusted state education distribution.

OCPW compares the differences in community level returns to education to the U.S. returns controlling for education and age. This measure would include differences in wage, hours worked and returns due to the ownership of physical assets.

Variable 3 = DODB or the average dollar value of defence contracts per worker in a given state for the years 1976, 1977, 1978.

Varbiable 4 = DODA or the average dollar value of defence contracts per worker in a given state for the years 1982, 1983, 1984.

Alternative Education Specification:

Although OCEW as described above is suggested as a valid measure for comparing educational distributions between states, an alternative educational specification is also included in the analysis based on more familiar criteria. The two alternative education variables are HSPERDIF and COLPERDIF where:

HSPERDIF = The difference between the percent of the working population over 25 that have completed high school.

COLPERDIF = The diffence between the percent of the working population over 25 that have completed at least four years of college.

Development of Hypotheses:

Table 2 shows the calculated values of the variables to be analyzed for each of the 50 states plus D.C. As can be seen the state with the lowest educational measure (OCEW) is Kentucky (-1180.31). This would indicate that on the average each worker in Kentucky above 25 years of age receives approximately $1180 less than the typical worker in the U.S. due to a lack of years of formal education. Likewise the state with the highest level of education is Alaska (1265.48). Comparing defense department contracts between these two states indicates that Kentucky had much less defence contracts per worker ($109.92) prior to 1980 than did Alaska ($826.99). The differences between the two states in terms of defence contracts are much greater after 1980 - $208 for Kentucky vs $2050 for Alaska.

Since we are interested in how does education across states change relative to other states in relation to relative differences in defence contracts, first differences are taken of each variable. Therefore the basic hypotheses to be tested are:

EDUCATION = f(PAY SCALE, DEFENCE DEPARTMENT CONTRACTS(-3))

DEFENCE DEPARTMENT CONTRACTS(+3) = f(EDUCATION, DEFENCE DEPARRTMENT CONTRACTS(-3))

In other words is there a relationship between past levels of defence contracts and present educational differences and is

Table 2: EDUCATION VS DOD CONTRACTS

STATE	OCEW	OCPW	DODB	DODA
KY	-1180.31	-768.51	109.92	208.59
ARK	-1143.51	-1808.22	66.64	328.33
WV	-1123.09	-458.77	88.97	113.58
MS	-1011.57	-2171.89	793.21	1518.97
TEN	-949.36	-1000.49	223.67	327.83
AL	-931.68	-1195.64	230.05	554.10
SC	-928.76	-1516.72	114.96	277.17
NC	-903.33	-1610.13	126.68	265.18
LA	-708.88	233.46	208.02	857.75
GA	-685.57	-681.71	219.66	884.18
PA	-417.47	-181.14	242.81	510.92
MO	-405.56	-448.19	997.51	2275.01
RI	-395.85	-1074.82	241.68	677.34
IND	-339.62	248.10	308.12	806.29
SD	-240.93	-2383.14	46.13	135.44
NDAK	-233.50	-1028.74	267.56	426.63
OH	-210.26	349.19	206.10	576.96
MA	-154.22	-2747.69	538.21	975.36
FL	-132.41	-755.44	207.95	772.21
OK	-117.63	-615.78	186.90	370.34
WIS	-92.76	-223.51	145.20	354.33
IA	-84.32	-265.59	194.12	256.61
TX	-67.37	303.12	477.76	1153.19
MI	-37.22	1166.02	264.37	429.35
ILL	-1.15	1375.13	99.86	241.42
VA	21.69	76.21	645.04	1878.65
NJ	146.01	864.67	310.81	738.59
NY	177.54	-31.17	436.44	957.45
NEB	192.62	-755.72	81.49	193.32
DEL	220.14	-59.62	174.08	750.32
MIN	316.24	-52.40	331.13	775.13
NMEX	333.92	-1320.26	269.99	812.76
NEV	356.68	885.27	69.48	306.79
KANS	366.61	-378.61	299.94	1459.38
IDAHO	369.60	-1279.80	38.97	142.39
NH	380.06	-1246.94	361.18	1187.04
VT	394.07	-2223.05	451.86	692.35
MONT	442.57	-1319.71	186.83	203.74
MD	481.80	934.35	512.74	1597.49
AR	508.24	-417.50	444.20	1139.44
CONN	525.82	719.74	1453.12	3234.25
MASS	571.79	-680.81	773.61	2015.42
HA	645.33	488.18	599.55	1142.56
WY	648.11	991.75	98.57	300.19
ORE	667.45	-261.66	53.19	148.31
CA	793.54	804.66	801.51	2092.84
WASH	867.33	574.26	754.21	1512.78
UT	1103.56	-374.37	323.78	1184.79
CO	1228.82	76.47	253.56	723.03
DC	1254.05	246.40	1516.82	2575.01
ALAS	1265.48	4996.39	826.99	2050.51

there a relationship between present educational differences and future defence contracts.

More formally the hypothesis to be tested are:

Hypothesis 1:

$$x_1 = \text{constant} + B_2 x_2 + B_3 x_3$$

$$H_0 = B_2 = B_3 = 0$$

Hypothesis 2:

$$x_3 = \text{constant} + B_1 x_1 + B_4 x_4$$

$$H_0 = B_1 = B_4 = 0$$

Where x_1, x_2, x_3 and x_4 are the first difference values of OCEW, OCPW, DODB and DODA respectively.

Method of Analysis:

Ordinary least squares will be performed on equations 1 and 2 to determine the degree of association between the dependent and independent variables. The t-statistic will be the criteria for accepting or rejecting the null-hypothesis of no association between the dependent and independent variables. The adjusted R^2 will be used to determine the goodness of fit of the equations and the F-statistic will be used to determine the overall significance of the equations.

Test of the Hypotheses

The results of linear multiple regression given in table 3 would indicate the rejection of the null hypotheses of no association between past levels of defence contracts and present educational levels. Educational levels as measured by OCEW are

Table 3: Multiple Regression Results Hypothesis I

	DEPENDENT VARIABLES		
INDEPENDENT : VARIABLES :	MODEL 1 OCEW	MODEL 2 HSPERDIF	MODEL 3 COLPERDIF
INTERCEPT	-19.50	-.363	-.00757
OCPW	.2345 (3.906)a***	.00250 (4.093)***	.000958 (2.879)***
DODB	.4517 (2.075)**	-.001278 (-.577)	.00530 (4.395)***
$ADJ\ R^2$	.297	.232	.383
F	11.35	8.36	16.22
SIGNIF.	.000	.000	.000

a, numbers in parenthesis are t-values
**, significant at the .05 level
***, significant at the .01 level

positively related to both present difference between the wage scale and past levels of defence contracts. The pay or wage scale variable is significant to the .01 level, while the defence contracts variable is significant to the .05 level. Both of the variables together account for 29.7 percent of the variance in educational differences. The coefficients on OCPW (Pay Scale) and DODB (Past Defence Contracts) can be interpreted as follows. Every one dollar increase in pay differences between states is associated with a $.23 increase in their educational differences, and for every one dollar increase in the differences in past defence contracts one can expect a $.45 increase in the differences in education. Therefore, past defence contracts seem to be associated in a positive way with educational levels of the state's work force. This influence may come primarily through migration of highly skilled and educated workers to those sights that produce the defence goods. In other words, the distribution of contract awards - which in some cases may be politically determined - could influence the distribution of education between states.

Also in table 3 two different specifications of the educational variable were tested resulting in very similar results for the COLPERDIF or college percent variable, but inconclusive results with the HSPERDIF or high school percent variable. These differences suggest that the college graduate may be more mobile than the high school graduate or simply that the defence industry has different demands for college versus high school graduates, which may further the assumption developed

earlier that defence contract awards may be a good proxy for "high tech" industry concentrations.

The second hypothesis was looking at the possible influence of the present stock of educational resources to the future distribution of defence contracts. The results of multiple linear regression as shown in table 4 leads one to reject the null hypothesis of no relation between future defence contract distribution and present differences in the educational stock of human capital across states. Both OCEW (education) and DODB (past defence contracts) are significant to at least the .01 level indicating a strong possibility that these variables may influence the future distribution of defence contract across states. The coefficients on OCEW and DODB indicate that a one dollar difference in present educational levels between states is associated with $.23 increase in defence contracts between the states. Of course a large part of the future allocations of defence contracts will be determined by past levels. The coeffecient of 1.9606 on DODB (past defence contracts) would indicate that over this six year time period a given state could almost expect a doubling of its level of defence contracts.

As with the previous table and analysis the conclusions of the model are not significantly affected by the method of measuring educational differences between the states. HSPERDIF and COLPERDIF are both positively correlated with future defence contracts and significant to at least the .01 level of the t-statistic.

Table 4: Multiple Regression Results Hypothesis II

INDEPENDENT VARIABLES :	DEPENDENT VARIABLES: MODEL 1 DODA	MODEL 2 DODA	MODEL 3 DODA
INTERCEPT	7.774	137.431	179.488
OCEW	.2294 (3.441)a***		
HSPERDIF		13.293 (2.944)***	
COLPERDIF			21.352 (2.623)***
DODB	1.9606 (16.395)***	2.0663 (20.327)***	1.939 (17.390)***
$ADJ\ R^2$	.878	.894	.891
F	177.74	208.26	200.82
SIGNIF.	.000	.000	.000

a, numbers in parenthesis are t-values
**, significant at the .05 level
***, significant at the .01 level

Summary

Both hypotheses of no association between defence contracts and education are rejected at the .05 level of significance. This indicates that present levels of education is associated with the past distribution of defence contract awards while at the same time associated with the future distribution of defence contract awards between the states. Therefore, defence contracts may have an important role to play in the distribution of human capital between the states.

This would indicate that future research on human capital formation and distribution should consider the possible influence of the distribution of defence contracts. If the distribution of defence contracts plays an important role in human capital distribution between states, policy people should be cognisant of these contracts as a possible policy lever in improving their state's stock of human capital. If defence contract awards are also an indicator of a state's ability to develop and attract "high tech" industries, this research adds fuel to the importance of the interrelated aspects of education and such industries .

BIBLIOGRAPY

Becker, G. S., Human Capital. New York: Columbia University Press, 1964.

Bhola, Jackqueline Taylor. "Earning Differentials in a Nonmetro Labor Market: A Case Study of Nine Kentucky Counties". Paper prepared for the Southern Rural Sociological Association Annual Meeting, February 2-5, 1986.

Bowman, Mary Jean and Robert G. Myers, "Schooling, Experience, and Gains and Losses in Human Capital Through Migration." Journal of the American Statistical Association 62 September 1967.

Jeong, Dong K."A Study on Change in Impact of Discrimination on Black/White Earnings Differentials During 1960-1970: A Simultaneous Equations Approach". Presented at the 92nd Annual Meeting of the American Economic Association, Atlanta, Ga, December 27-30, 1979.

McCrackin, Bobbie. "Education's Contribution to Productivity and Economic Growth". Economic Review, Federal Reserve Board of Atlanta, November, 1984.

Mu'min, Ridgely A. "Index For Measuring or Comparing Community Human Capital", Paper prepared for the Southern Rural Sociological Association Annual Meeting, New Orlean, La., February 1-3, 1988.

Schultz, Theodore W. Investment in Human Capital. New York: The Free Press, 1971.